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FACTS AND FIGURES

IN-Campus – Technology park for future projects of AUDI AG

The abbreviation “IN” denotes innovation: With the IN-Campus, AUDI AG and the city of Ingolstadt have gotten a strategic investment off the ground. They work together to remediate the site of a former oil refinery and transform this industrial wasteland into a campus. The focus is on the development work for future-oriented projects. The future technology park IN-Campus is designed to be open, sustainable and close to nature. Construction is in full swing and the first buildings are already in use.

The buildings in construction section 1

The IN-Campus is being built on a former refinery site in Ingolstadt. In 2015, IN-Campus GmbH, a joint venture of AUDI AG and the city of Ingolstadt, acquired the majority of this industrial wasteland. The necessary remediation of the ground and groundwater started in fall 2016 in the north of the site; it is planned to be largely completed by late 2022. Building work has already started on the remediated and unpolluted sections of the site. The buildings from construction section 1 are due to be ready in 2023. IN-Campus GmbH is investing in a campus – the focus is on the technologies of the future.

A major strength of the IN-Campus site is the continuous area of 75 hectares, the likes of which cannot be found anywhere else in Ingolstadt or the region. It offers an opportunity to create a spacious, flexible and attractive technology park in which high tech and creativity co-exist. 60 hectares will form the commercial and industrial area in the future; building work on them is to be completed in three phases. Another advantage is the location of the area: It is located close to the Audi parent plant in the east of Ingolstadt and directly on the A9 highway.

► **Open and close to nature: The site as a whole**

The IN-Campus has been designed as an open site without a plant fence, i.e. as a genuine campus. At its southern edge can be found the Audi Sportpark (the stadium of FC Ingolstadt 04), while a commercial park lies adjacent to it in the west. In the north and east, sparse woodland stretches along the banks of the Danube. The transition to it takes place in a 15 hectare green corridor; this is where a riverside woodland with nutrient-poor grassland and willow trees is being created to act as a compensation area. In this way, the IN-Campus connects the urban



world with the quietness of the Danube wetlands; it creates an interface between high tech and nature. From north to south – from the Danube to the stadium – a parkway roughly one kilometer (*0.6 mi*) long with generous green areas runs across the IN-Campus. At several points, this “Campus vein,” which is approximately 50 m (*164.04 ft*) wide, expands to create small places, a vital communication and meeting space for the employees and campus visitors.

► **Ideas factory: The project house**

Considerable construction work has been underway on the IN-Campus since fall 2018. A distinctive building area in construction section 1 is called the project house. Already completed, it is a large complex consisting of four buildings in the northwest of the site. The people there work on future technologies. The new ideas factory offers space for around 1,400 employees from Audi and selected partner companies – 42,000 m² (*452,084.2 sq ft*) of office and workshop space, rounded off by conference rooms and catering facilities. The first tenants have already moved into their spaces in the project house. The remaining areas are being configured for the tenants. CARIAD pools the Volkswagen Group’s software competence and is based organizationally in Ingolstadt. CARIAD moved into the first of its offices on the IN Campus in late 2020. The technology park will provide CARIAD’s IT experts with an attractive environment for flexible working.

Infrastructure work for construction section 1 are also underway. There is a direct connection between the IN-Campus and the A9 highway, and the newly constructed IN-Campus Allee was opened to public traffic in January 2021. The A9 highway has been serving as a digital test field for the development of automated driving for many years now. This test field is now being extended to the IN-Campus via Auswaldseestrasse.

► **Ultra-modern technology: The Vehicle Safety Center**

The largest building in construction section 1 will be the Vehicle Safety Center, construction of which started in spring 2020 and is scheduled for completion in mid-2023. The main building forms a cube with an edge length of 130 x 110 m (*426.5 x 360.9 ft*) and a height of 20 m (*65.6 ft*).

The heart of the structure is formed by the crash arena, a support-free area 50 x 50 m (*164.04 ft x 164.04 ft*) in size. A mobile crash block can be moved around the crash arena, which makes performing the diverse range of crash experiments highly efficient. Multiple crash tracks criss-cross the area so tests involving collisions between two vehicles and active safety testing can be performed. The longest run-up track is 240 meters (*787.4 ft*) long and permits tests at speeds greater than what are typically required. An innovative sled track with a braking unit will make seatbelt airbag development even more efficient. Cutting-edge high-speed cameras and energy-efficient LED lighting systems support the work of the team at the Vehicle Safety Center. A dummy lab, component test benches, workshops and offices round out the building. The new Vehicle Safety Center will take over the tasks currently performed by the existing system on the



technical development site. It will be able to handle many more complete vehicle crashes per year than in the past. The concept, technology and adjacent expansion areas ensure that it will meet the requirements for many years to come. This is important in light of the increasingly strict standards and regulations on the global markets and new technological challenges. Despite the rapid progress made in simulation technology, real crash tests and component tests in hardware remain essential.

► **Smart energy: The Energy Control Center**

The Energy Control Center is being built northeast of the project house. Not only does it supply energy, it is also the heart and brain of the energy system concept for the IN-Campus.

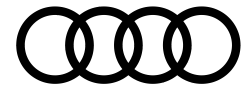
The LowEx network is a major element in the innovative energy system. This water-based piping network acts as a heat source and a heat sink for all the buildings on the IN-Campus. Plastic lines with a pipe diameter of around 60 - 80 cm (23.6 - 31.5 in) are already being laid in the ground of construction section 1. Buildings with a high cooling load release waste heat that accrues (e.g. IT center) into the network, while buildings with a high heating load take the necessary energy from the LowEx network. In this way, consumers become generators. The network's temperature deliberately moves between 5°C and 30°C by using the seasonal fluctuation – this is ideal, e.g. in order to feed environmental heat or waste heat into the network. The necessary system temperatures are guaranteed by means of reversible heat pumps in the buildings in question.

Thermal energy storage systems in the Energy Control Center make a major contribution to load management and to increasing the energy efficiency of the overall system. With a volume capacity of around 3,000 cubic meters, they save both heat and cold.

The CEC system (cross energy concept) acts as the central intelligence for the energy supply. It manages the interaction of all technical components for the purpose of maximum efficiency. The energy concept is modular and highly flexible. In construction section 1, the IN-Campus procures electricity and district heat from outside. The medium-term vision is a zero-energy campus, one which uses self-generated and regenerative energies to a considerable extent and integrates new innovation components for this purpose again and again. This can be a photovoltaic system with a high efficiency level or an industrial fuel cell – or even technologies that are not even on the market yet.

► **Digital nerve node: The IT Center**

A new IT Center is being built between the project house and the vehicle safety center on a floor space of almost 10,000 m² (107,639.1 sq ft). This will house around 8,000 servers and storage and network components on an area of 2,000 m² (21,527.8 sq ft) for IT. The IT Center will support AUDI AG's future-oriented projects with ultra-modern hardware and software; in its technical concept, maximum availability and the highest level of failure safety are given utmost importance.



▶ **Safety in the spotlight: The functional building**

A two-story functional building will be located in the north east of the IN-Campus. Property protection facilities, training rooms, a dedicated fire station for the IN-Campus and an emergency medical center will be based here. Construction began in 2020.



Remediation of the former refinery site

IN-Campus is being built on a former refinery site, which was in operation for 43 years. Various petroleum products were made here from 1965 to 2008. When operation stopped here, the systems were dismantled by 2013. In fall 2015, IN-Campus GmbH, a joint venture of AUDI AG and the city of Ingolstadt, acquired the site and signed a public-law remediation contract a few months later.

The 1,200 or so exploratory drilling operations and 50,000 laboratory analyses conducted over a number of years had revealed that 22 hectares were polluted and in need of remediation. The soil contained 900 metric tons of fuel oil, 200 metric tons of light gasoline and 100 kilograms (220.5 lb) of perfluorinated and polyfluorinated chemicals (PFCs). The necessary remediation of the ground and groundwater started in fall 2016 – carried out by ARGE IN-Campus GbR, a working group made up of three specialist companies that uses ultra-modern methods. Most of the remediation work is set to have been completed by late 2022. Groundwater remediation is likely to continue until 2028.

The project incorporates four particular methods: groundwater treatment, air sparging, honeycomb excavation and downstream soil washing.

Groundwater treatment involves ten wells at the edge of the site that are equipped with electric pumps to draw polluted groundwater out of the soil. A treatment system removes up to over 99.9% of pollutants.

The **air sparging method** is designed to combat volatile hydrocarbons, which are components of gasoline fuels. Air is blown into the ground through hundreds of pipelines and picks up dissolved pollutants in the soil and groundwater. Just beneath the surface of the site, the air is extracted through drainage pipes and cleaned.

The polluted soil is excavated so that the PFC residue from firefighting foams and total petroleum hydrocarbons – left by the fuel oil – can be eliminated. This takes place by means of an innovative and high-precision technique in which hydraulic rams drive **steel hexagons** into the earth using vibration. In total, they are excavating 600,000 metric tons of material from the soil, mostly involving the sand and gravel typical of the site.

A **soil washing facility** uses water to clean pollutants from the soil grains. The water circulates via a treatment system, while another system cleans the resultant exhaust air. More than 90% of the material delivered to the facility is returned to the hexagonal “honeycomb” holes; the rest is disposed of.

The remediation of the IN-Campus site is one of the largest ongoing ground remediation projects in Germany and the first complete remediation of a refinery site ever to take place in Bavaria. A team of independent experts monitors all the processes and documents them in a geographic information system. The IN-Campus project has already aroused considerable interest among the professional public; people frequently inquire about the cleanup measures on the site.



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The Audi Group, with its brands Audi, Ducati and Lamborghini, is one of the most successful manufacturers of automobiles and motorcycles in the premium segment. It is present in more than 100 markets worldwide and produces at 19 locations in 12 countries. 100 percent subsidiaries of AUDI AG include Audi Sport GmbH (Neckarsulm, Germany), Automobili Lamborghini S.p.A. (Sant'Agata Bolognese, Italy), and Ducati Motor Holding S.p.A. (Bologna/Italy).

In 2020, the Audi Group delivered to customers about 1.693 million automobiles of the Audi brand, 7,430 sports cars of the Lamborghini brand and 48,042 motorcycles of the Ducati brand. In the 2020 fiscal year, AUDI AG achieved total revenue of €50.0 billion and an operating profit before special items of €2.7 billion. At present, around 87,000 people work for the company all over the world, 60,000 of them in Germany. With new models, innovative mobility offerings and other attractive services, Audi is becoming a provider of sustainable, individual premium mobility.
